

The Inevitability of Soybean Cyst Nematode

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NSERC Senior Industrial Research Chair

“Cutting Through the BS”

Soils and Crops

Saskatoon, Saskatchewan

March 11, 2020



**University
of Manitoba**

Table 1. Estimated soybean yield losses from diseases in the top 28 U.S. soybean-producing states and Ontario, Canada, in 2015.

Disease/Pathogen	2015 Estimated Yield Losses for U.S. (thousands of bushels)	2015 Estimated Yield Losses for Ontario (thousands of bushels)
Root Rots and Seedling Blights		
Soybean cyst nematode	109,288	3,696 ✓
Seedling diseases (caused by species of <i>Fusarium</i> , <i>Pythium</i> , or <i>Rhizoctonia</i>)	62,948	2,957 ✓
Root-knot nematode	12,366	0
Reniform nematode	4,438	0
Other nematodes (lesion, Columbia lance, sting, stubby root)	1,465	148
Leaf and Aboveground Diseases		
Septoria brown spot	26,868	37
Frogeye leaf spot	17,662	15
Cercospora leaf blight	12,840	0
Downy mildew	4,383	7
Bacterial diseases (bacterial blight and bacterial pustule)	2,774	4
Virus Diseases (AMV, BPMV, SbDV, SMV, SVNV, TRSV, TSV)*	2,602	74
Other leaf and aboveground diseases (Phyllosticta leaf spot, target spot)	2,427	0
Purple seed stain	1,594	15
Rhizoctonia aerial blight	652	0
Soybean rust	157	0

2015 Soyben Disease Losses U.S. and Ontario

Stem Diseases		
Sudden death syndrome	43,776	2,218 ✓
Sclerotinia stem rot (also known as white mold, caused by <i>Sclerotinia sclerotiorum</i>)	40,083	2,957 ✓
Phytophthora root and stem rot	28,275	1,479 ✓
Charcoal rot	20,808	15
Brown stem rot	17,389	74
Stem canker	12,349	222
Pod and stem blight	10,718	296
Anthracnose	5,188	0
Diaporthe/Phomopsis complex (seed rot)	3,612	44
Fusarium wilt and root rot	3,169	1,109 ✓
Other stem diseases (Phymatotrichopsis root rot, red crown rot, taproot decline)	2,253	0
Southern blight	523	0

*AMV = alfalfa mosaic virus, BPMV = bean pod mottle virus, SbDV = soybean dwarf virus, SMV = soybean mosaic virus, TRSV = tobacco ringspot virus, TSV = tobacco streak virus.

Cropprotectionnetwork.org



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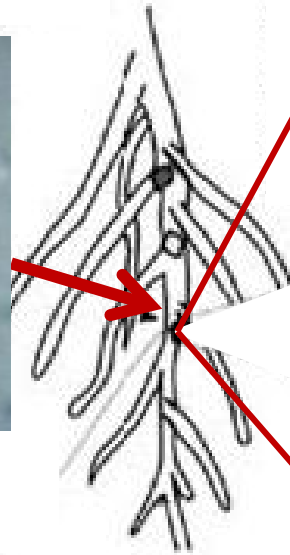
Soybean Cyst Nematode (SCN)

- Is a nematode (round worm) that parasitizes roots of soybean
- Like people, not all nematodes are bad, but SCN is bad

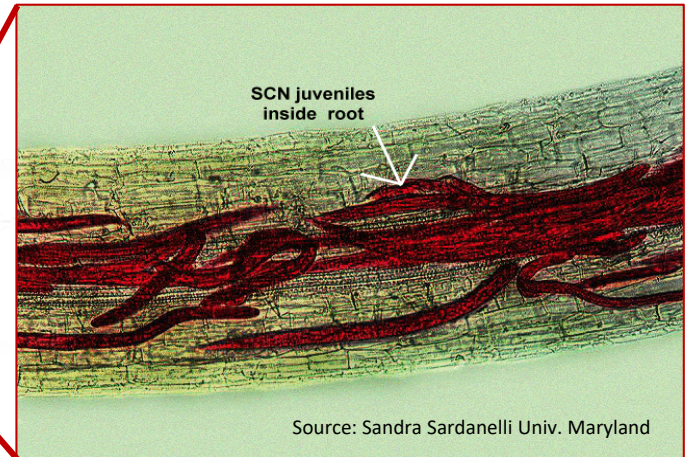


The Life of a SCN Female

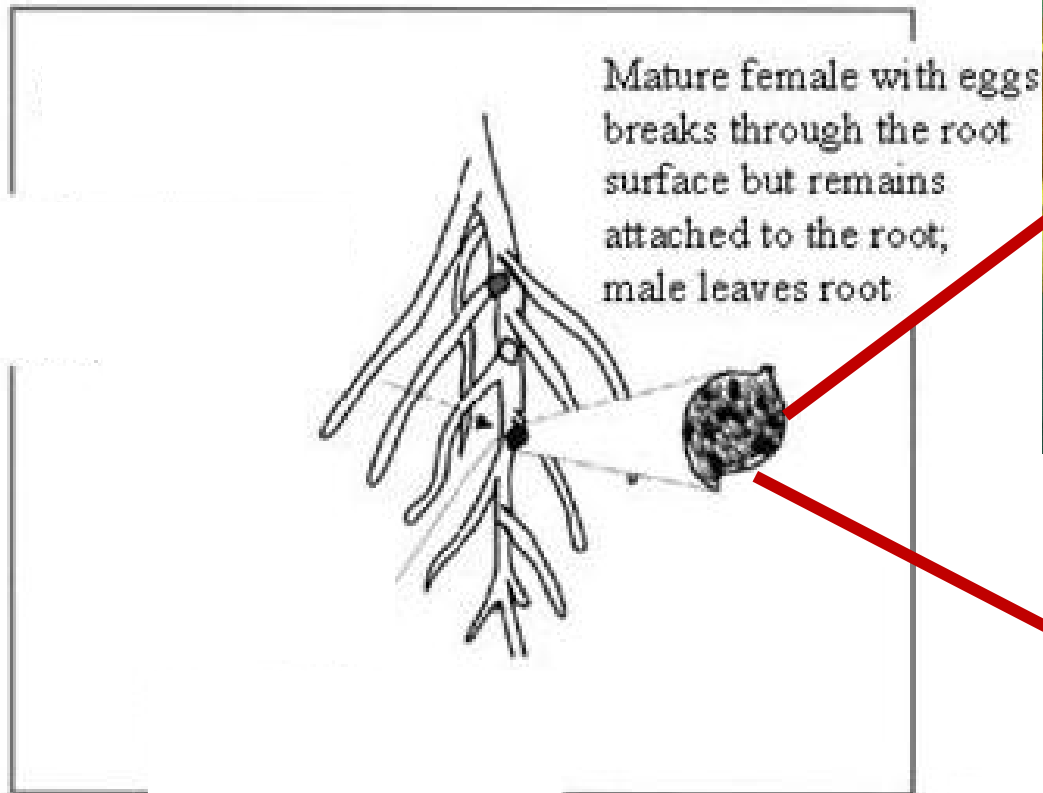
Soil



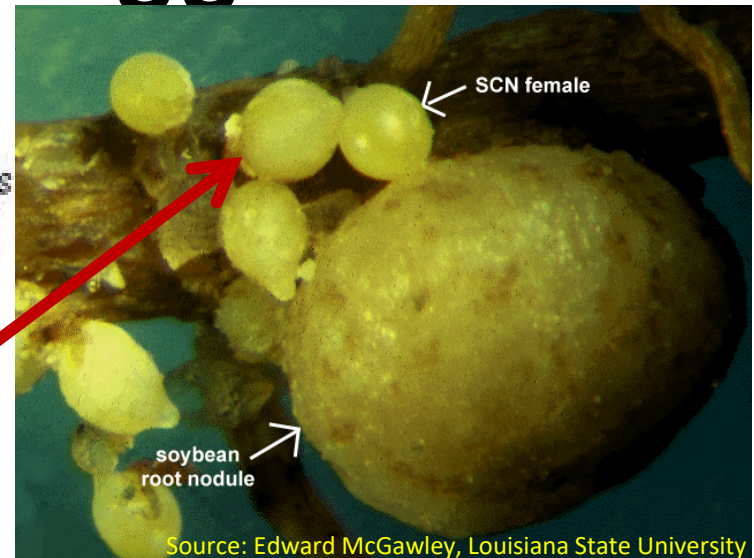
Root



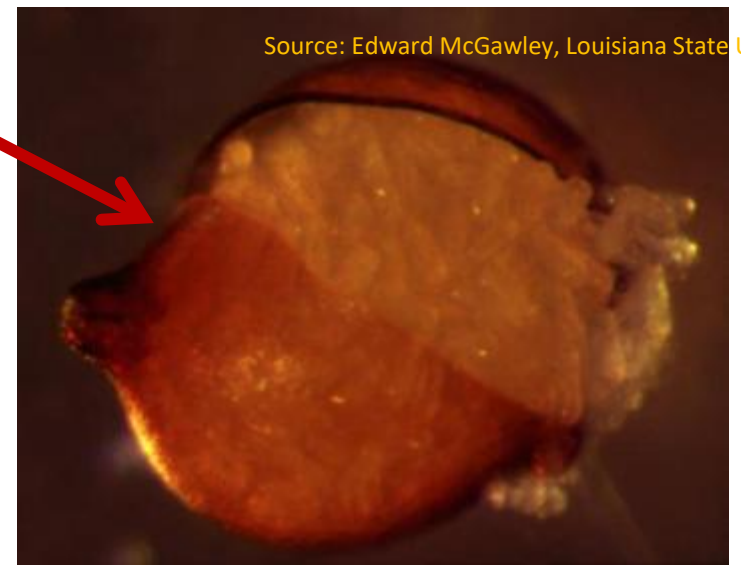
Female Settles Down to Feed and Produce Eggs



Source: Greg Tylka Iowa State Univ.



Source: Edward McGawley, Louisiana State University



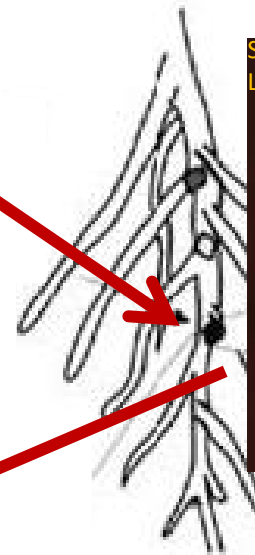
Source: Edward McGawley, Louisiana State University

Female Becomes Cyst Eventually Rupturing and Releasing Eggs

Soil



Eggs released in soil,
develop into juveniles



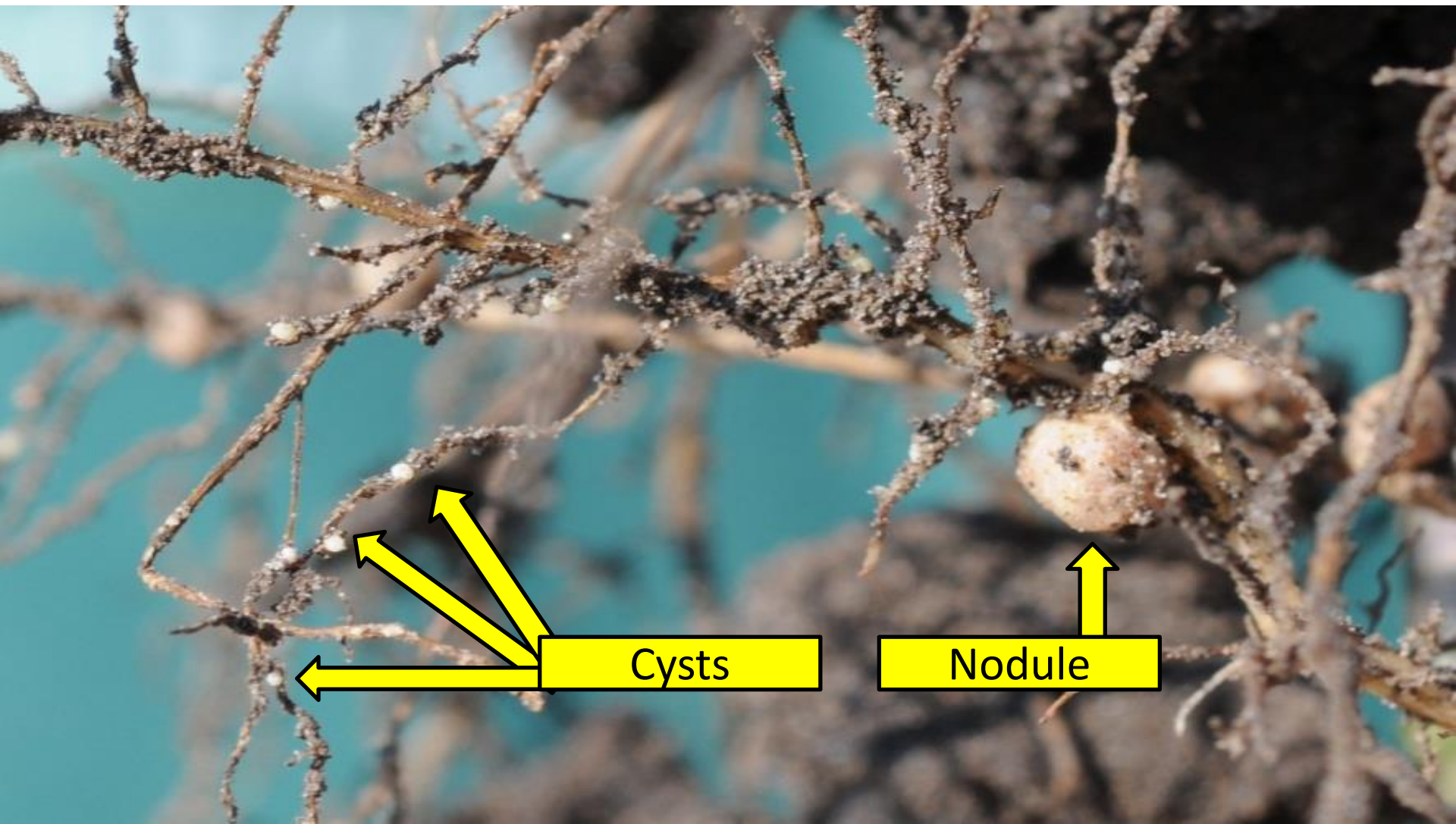
Source: Edward McGawley,
Louisiana State University



White, lemon-shaped cysts on roots



Source: Albert Tenuta OMAFRA



Cysts

Nodule

SCN is Spreading to all Soybean Areas of Canada and U.S.

- Japan in 1880
- North Carolina in 1954
- Moved rapidly from there through much of soy growing area of the U.S.
- Minnesota in 1978
- Ontario in 1987
- North Dakota in 2003

The Quick March North



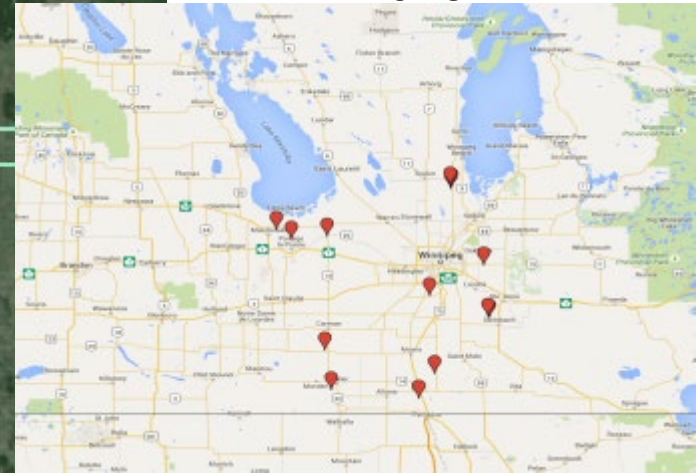
SCN in Manitoba?

- Canadian Food Inspection Agency (CFIA) has done some survey work of random fields
- CFIA found in survey of potato soil in 2010 what seemed to be a lot of SCN in one field
- *CFIA has removed SCN as a Regulated Pest in Canada and thus will not survey fields any longer*

SCN Survey of Manitoba 2012-2015

- 76 soybean fields sampled
- > 5500 soil samples
- 487 composite samples for processing
- Priority fields based on
 - Proximity to water courses from U.S. that flood
 - Number of soybean years
 - History of dry beans
 - Sampled prone areas of fields

2015

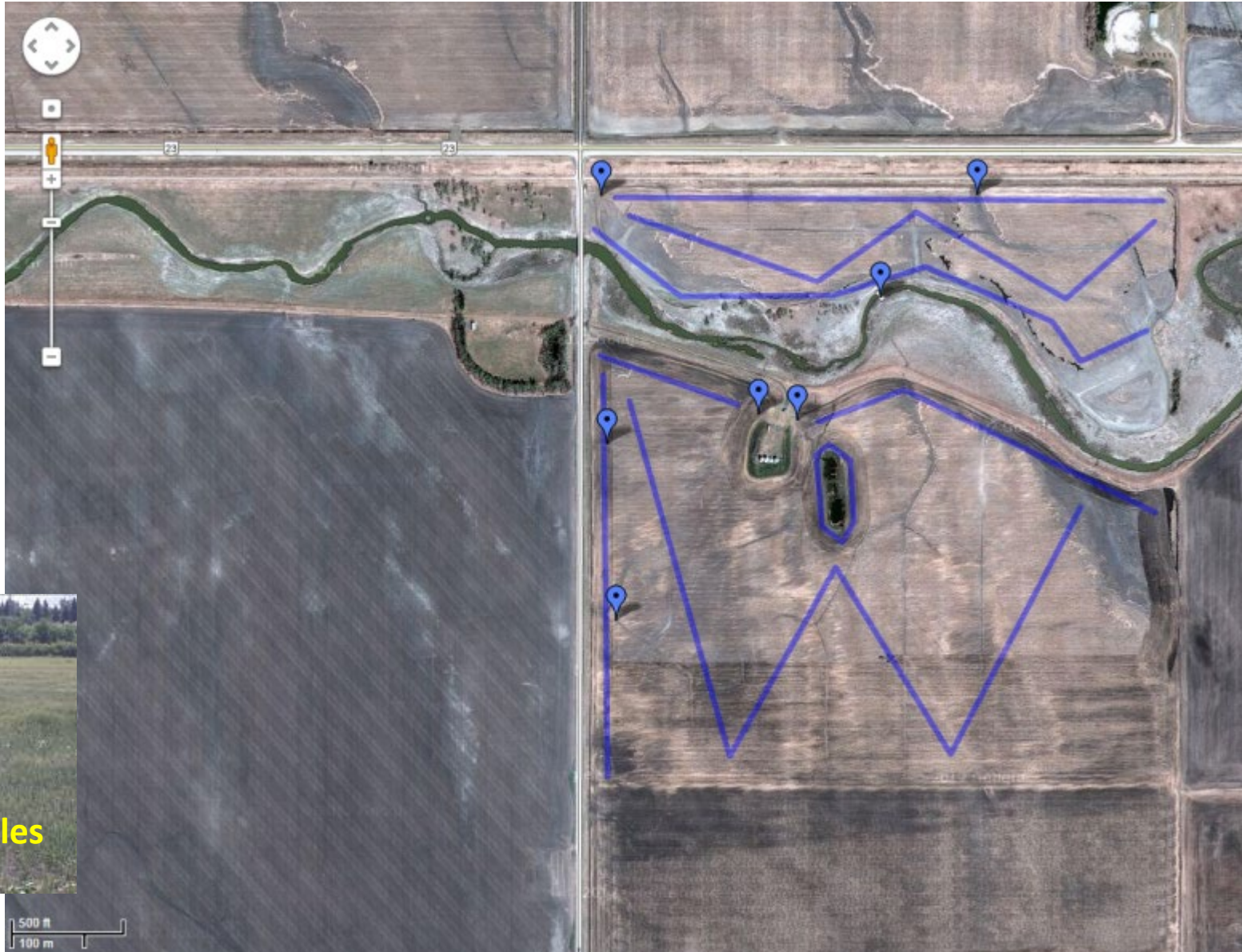


Winnipeg

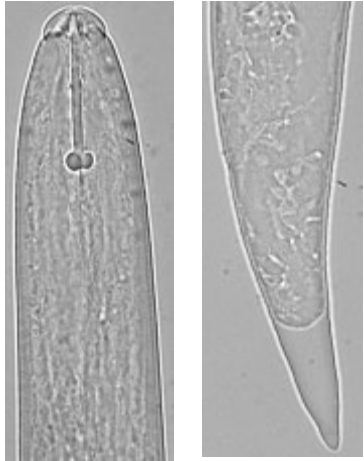
35 fields
sampled Oct/Nov
2012

13 fields
sampled
July/Aug 2013

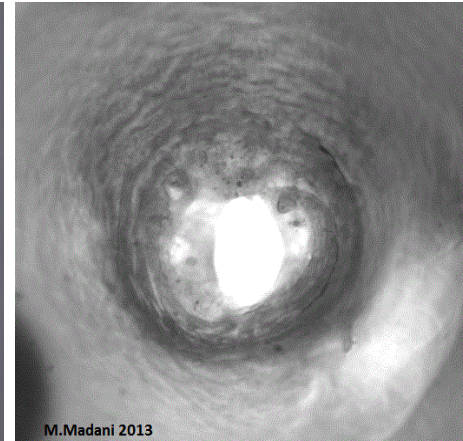
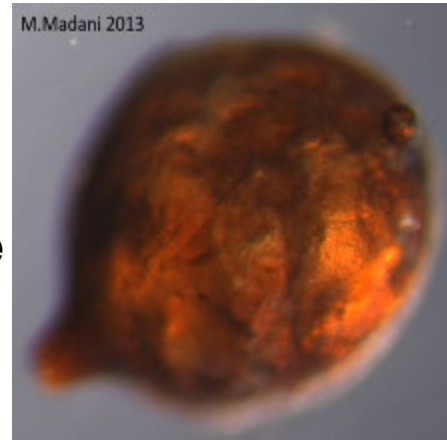
Collecting Soil Samples



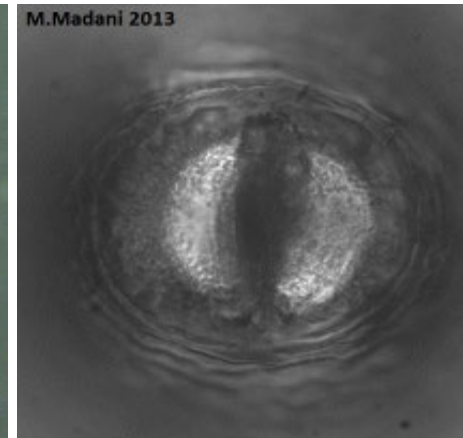
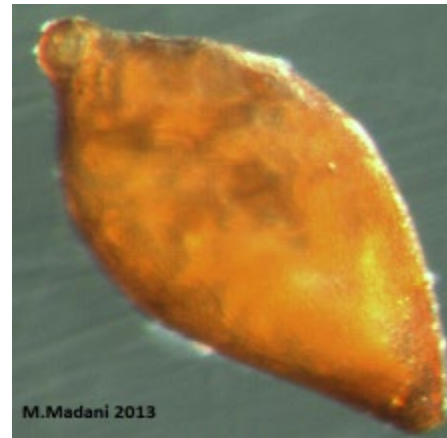
Juveniles and Cysts



Circumfenestrate



Bifenestrate



Results

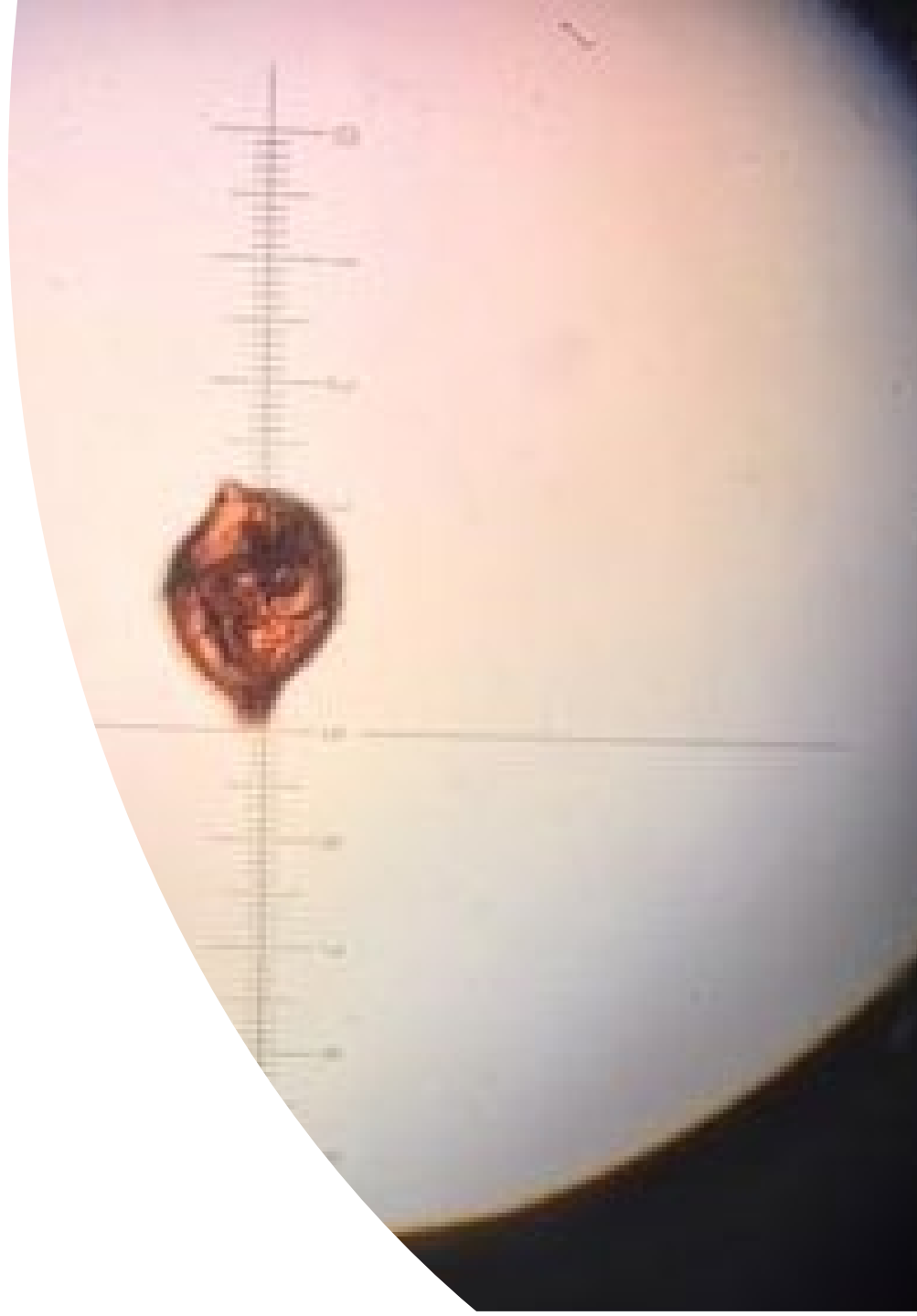
2012/13

- 37 composite samples from 22 fields had cysts
- Total of 60 cysts recovered
- 26 cysts were not damaged
- 23 cysts had circumfenestrate vulval cone structures –
Cactodera, *Punctodera*,
Betulodera
- 3 cysts were bifenestrate –
Heterodera



Results

- 15 circumfenestrate cysts had eggs or juveniles
- 1 bifenestrate cyst had eggs and juveniles
- ITS sequencing, species-specific PCR
- Circumfenestrate cysts ITS matched *Cactodera*
- Bifenestrate cyst ambiguous – *Heterodera* by morphology, not SCN by species primer sets, *Cactodera* by ITS sequencing

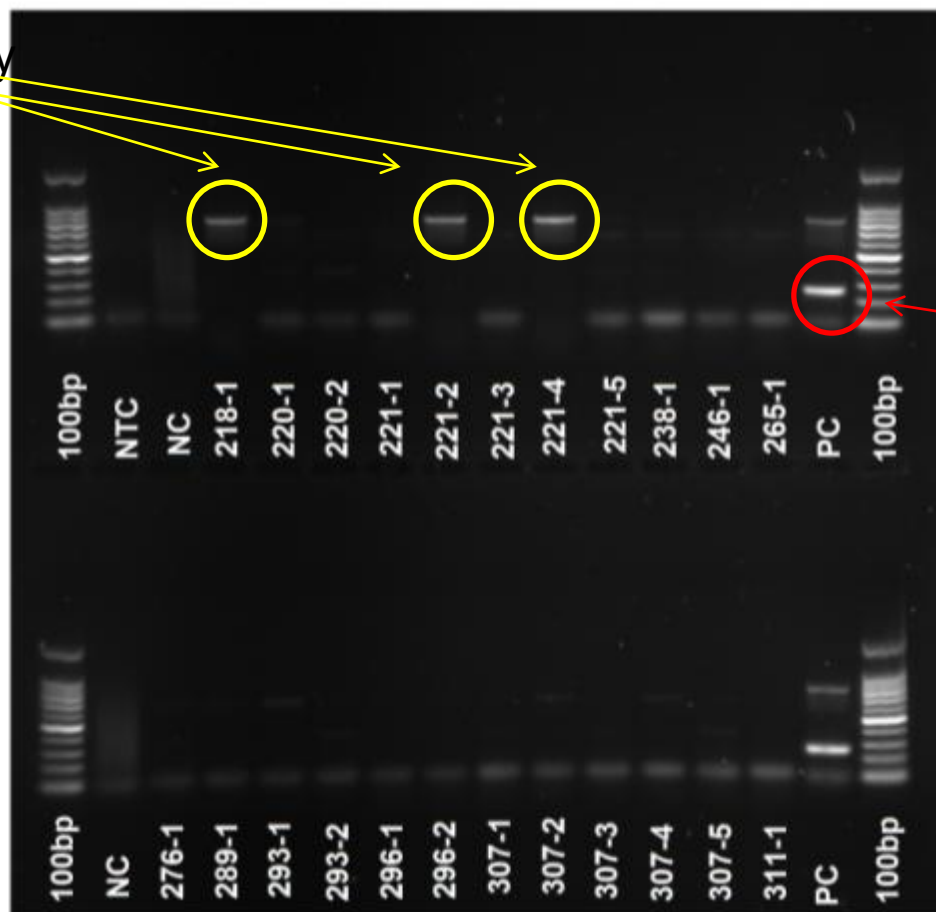


Results 2014/15

- 28 fields sampled
- 205 composite samples analyzed
- 32 samples had cysts, but only a few each
- Most cysts were round and not lemon shaped
- Cone top patterns circumfenestrated
- 6 cysts yielded DNA for analysis, failed to be SCN

Species Specific PCR for SCN in 2015

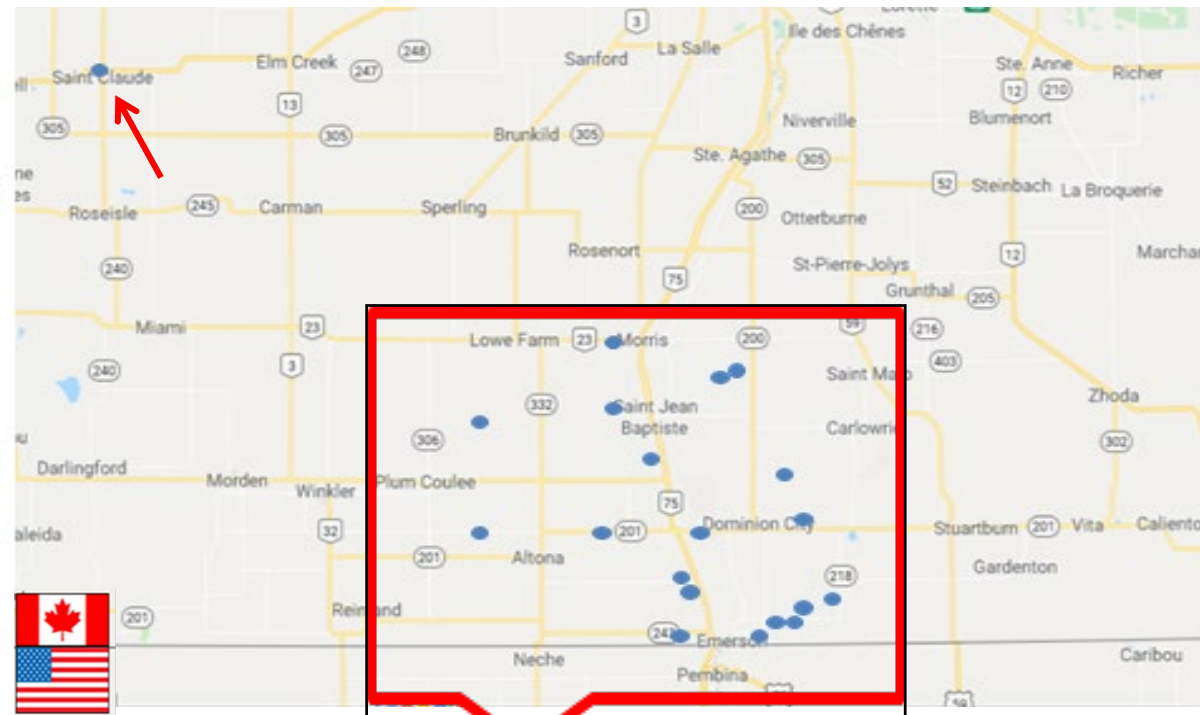
3 cysts yielding quality
DNA but not positive
For SCN



Positive control SCN
yielding good DNA and
giving band for SCN

Manitoba 2017/2018 SCN Survey

- Fall 2017, 30 soybean fields soil sampled
- Samples have been extracted and being analyzed now for cysts



PhD student: Nazanin Ghavami

Results 2018

- 30 commercial soybean fields were sampled
- A total of 90 composite soil samples were obtained
- Overall, 17 of the composite samples from 7 fields had nematode cysts
- One to a few cysts were recovered from each of these 17 composite samples
- In total, 42 cysts were recovered and 30 of the cysts from seven fields were brown and lemon-shaped as expected of SCN

Results 2018

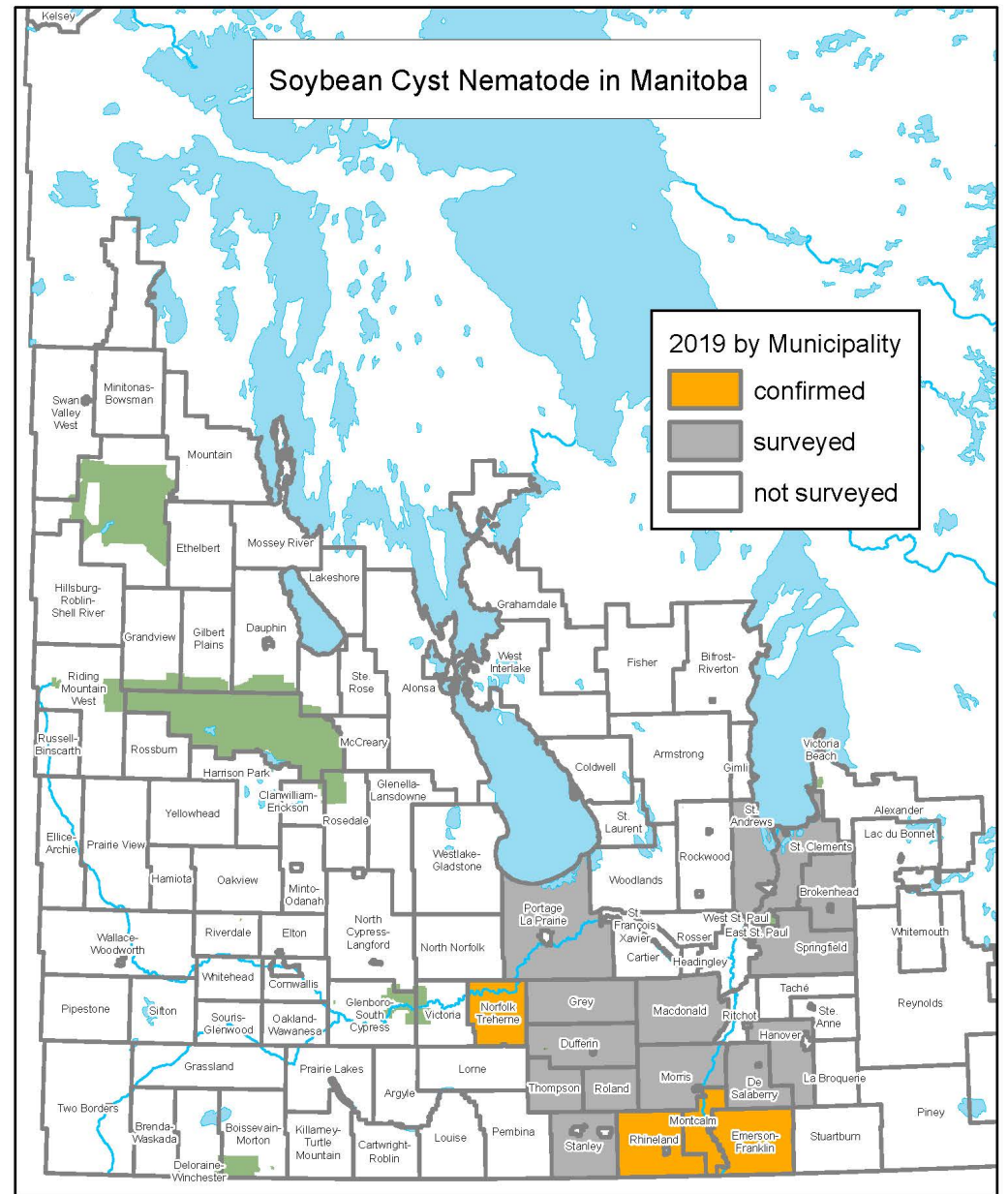
- Cyst numbers were 1, 2, 4, and 14 kg⁻¹ soil for each of the fields
- PCR of 7-12 lemon-shaped cysts for the CoxIII gene & SCAR gene regions were SCN
- DNA sequencing of 18s and ITS genes also confirmed cysts were SCN
- Morphology of cysts and nematode juveniles also consistent with being SCN
- In 2019, soy grown on field in Norfolk Treherne

- In 2019, soy grown on field in Norfolk Treherne
 - Visited the field twice and on second visit found SCN on roots of soy
-

Results 2019



Map Summary



Author: Les Mitchell
Date: September 12 2019
Source: MB Ag confirmation



1:2,300,000

0 45 90 180 Kilometers



On-going

- SCN positive fields resampled in 2020
- Lots of soil brought to lab
- Soy grown in soil to show reproduction on roots
- Build population to determine HG type of SCN population here



Damage Patches in Fields



Source: American Phytopathology Society



Source: Albert Tenuta OMAFRA

Can be Confused with Drown Outs



Source: Albert Tenuta OMAFRA

Can be Confused with Iron Chlorosis



Source: Jay Goos North Dakota State University

Effects of SCN on Soybean

What does it do?

- Takes away nutrients
- Water uptake disrupted
- Interferes with nodulation
- Damages roots (holes)

Field symptoms?

- Yellowed plants
 - Resembles Iron Chlorosis
- Stunted plants
 - Uneven height
- Early maturity
- Reduction of yield
- Fewer pods
- Damage shows earlier on sands

Avoid Host Plants in Fields

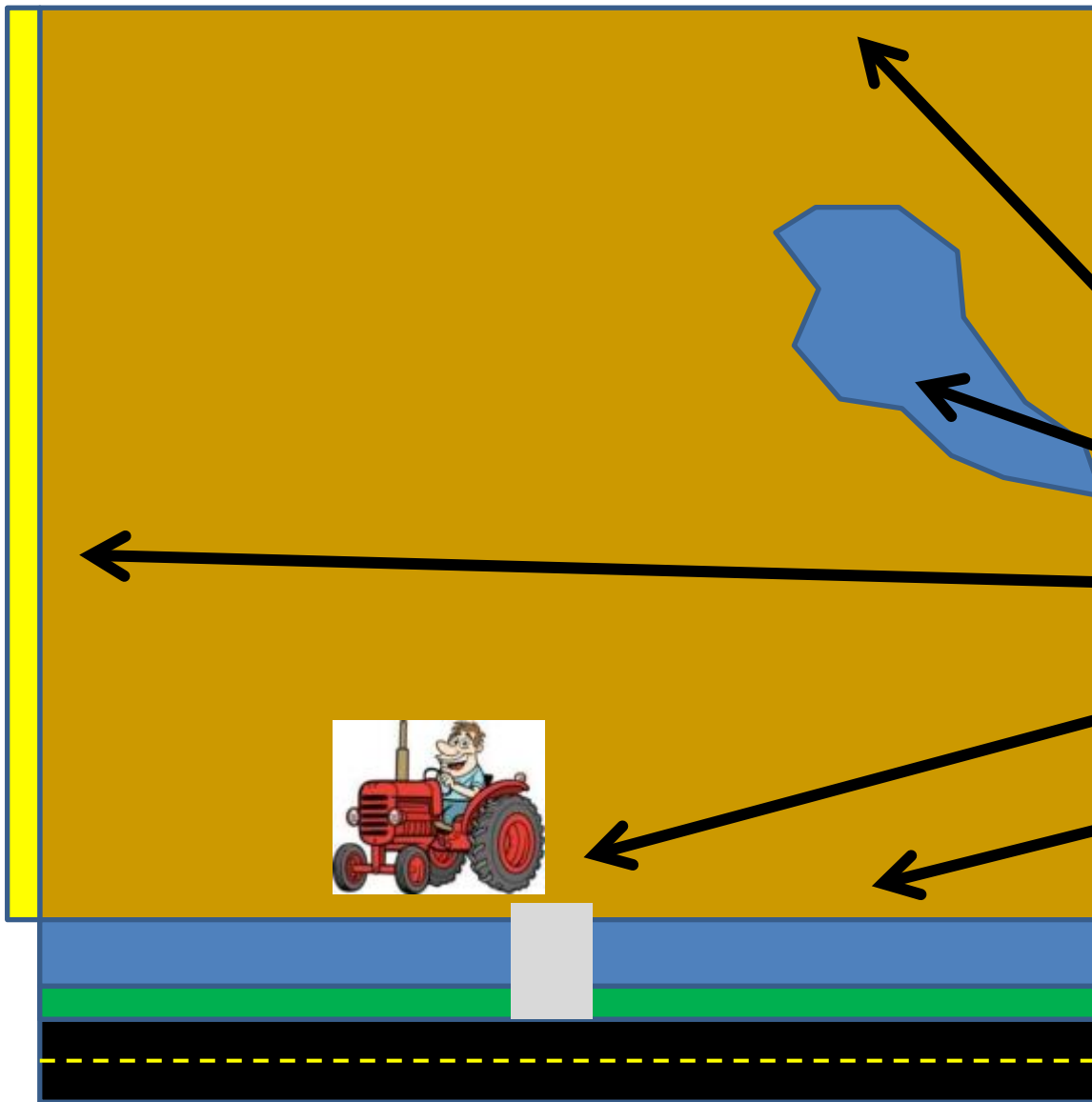
Crop Plants

Adzuki Bean
Alsike Clover
Bird's-foot Trefoil
Common Vetch
Cowpea/Black-eyed Pea
Crimson Clover
Crownvetch
Pinto, Navy, Cranberry, Black, Kidney, Great Northern, Snap Bean
Hairy Vetch
Lespedezas
Lima Bean
Lupines
Mung Bean
Pea
Soybean
Sweet Clover

Weed Plants

American Vetch
Carolina Vetch
Common Chickweed
Common Mullein
Field Pennycress
Hemp Sesbania
Henbit
Hop Clovers
Milk Vetch
Mouse-ear Chickweed
Pokeweed
Purple Deadnettle
Purslane
Shepherd's Purse
Wild Mustard
Winged Pigweed
Wood Vetch

Risk Areas in Fields



Headlands

Depressions

Fences

Entrance ways

Sloughs

Prevent Soil Movement Between Fields

- Purchase clean used equipment
- Wash implements and tires between fields
- Don't drive pickups between fields
- Clean footwear



Source: Greg Tylka Iowa State Univ.



Source: Sandra Sardanelli Univ. Maryland

Prevent Birds From Landing on Fields



Use Resistant Soy Varieties



Not Resistant

Not Resistant

Source: Albert Tenuta OMAFRA

Resistant Varieties

Manitoba Seed Guide

HERBICIDE TOLERANT SOYBEANS ♦ VARIETY DESCRIPTIONS ♦ EASTERN MANITOBA

Manitoba Maturity Zone	Company Maturity Group	Variety	Type	Average DTM +/- Check†	Yield % Check	Site Years Tested	Hilum Colour	IDC		Resistance	
								Rating (1–5)	Group	SCN	PRR
Very Early- Season Zone	000.8	LS TRI8XT	R2X	-10	86	2	BL	1.9	ST	yes	1c
	000.5	NocomaR2	R2Y	-9	94	12	BL	2.0	ST	–	1c
	000.9	S0009-M2	R2Y	-9	89	12	IY	2.0	ST	–	6
	00.4	TH89004 R2X	R2X	-8	94	2	BR	1.8	ST	–	1c
	000.7	PS 00078 XRN	R2X	-7	95	8	BL	1.9	ST	yes	1c
	00.2	Devo R2X	R2X	-6	94	8	BR	1.8	ST	–	–
	000.9	RX000918	R2X	-6	103	2	BL	1.7	T	yes	1c
Early- Season Zone	00.1	P001A48X	R2X	-5	99	2	TN	1.7	T	–	1c
	00.1	PV 11s001 RR2	R2Y	-5	90	12	Y	1.9	ST	–	1c
	000.7	Karpo R2	R2Y	-5	104	2	GR	2.2	ST	–	–
	00.2	RX00218	R2X	-5	89	8	BR	1.9	ST	–	–
	000.2	Notus R2	R2Y	-5	103	8	BL	1.6	T	–	1c
	00.3	P003A97X	R2X	-5	99	2	GR	1.9	ST	yes	1k
	00.1	Torro R2	R2Y	-5	100	12	BL	2.2	ST	–	–
	00.2	NSC Redvers RR2X	R2X	-4	97	2	BL	1.9	ST	yes	1c
	000.9	PV 15s0009 R2X	R2X	-4	99	8	BL	2.0	ST	yes	1c
	00.4	NSC Culross RR2X	R2X	-3	98	2	BL	1.7	T	–	1c
	00.1	LS 001XT	R2X	-3	105	8	BL	1.7	T	yes	1k
	00.5	Lono R2	R2Y	-3	107	8	Y	2.0	ST	–	1c
	00.3	Dinero R2X	R2X	-2	97	8	IY	1.7	T	–	–
	00.4	TH 32004R2Y	R2Y	-2	102	2	BL	1.7	T	–	1c
	00.1	Prince R2X	R2X	-2	94	8	BL	1.7	T	–	1k
	00.6	S006-M4X	R2X	-2	98	8	IY	1.9	ST	–	1c
	00.5	S007-Y4	R2Y	-2	103	12	IY	2.0	ST	–	1c

SCN Emerging Issue for Dry Beans

plant disease

Editor-in-Chief: Alison E. Robertson
Published by The American Phytopathological Society

[Home](#) > [Plant Disease](#) > [Table of Contents](#) > [Full Text HTML](#)

[Previous Article](#) | [Next Article](#)

February 2017, Volume 101, Number 2

Page 391

<https://doi.org/10.1094/PDIS-09-16-1257-PDN>

DISEASE NOTES

First Report of the Soybean Cyst Nematode *Heterodera glycines* Infecting Dry Bean (*Phaseolus vulgaris* L.) in a Commercial Field in Minnesota

G. P. Yan, A. Plaisance, I. Chowdhury, R. Baidoo, A. Upadhaya, J. Pasche, S. Markell,
and B. Nelson, North Dakota State University, Department of Plant Pathology, Fargo
58108-6050; and S. Chen, University of Minnesota, Department of Plant Pathology, St. Paul
55108.

- 2016 stunted patches in dark-red kidney bean field
- Roots infested with SCN females
- Soybean last grown in 2010



Sudden Death Syndrome

- First reported 1971 in Arkansas
- Disease complex of SCN with *Fusarium virguliforme*
- Occurs after first flowering
- In Minnesota and South Dakota

Westphal, A., T.S. Abney, L.J. Xing and G.E. Shaner. Sudden Death Syndrome of Soybean. 2008. *The Plant Health Instructor*. DOI:10.1094/PHI-I-2008-0102-01

Scout for SCN

- Fields more than 3 years of soybean
- Get out of the truck and walk
- 30-45 days after emergence, gently lift roots with spade, dunk in bucket of water for clay, look for females using a hand lens
- Up to 21-28 before ready for harvest
- Collect soil samples and SCN test (Agvise or Soil Ecology Lab U Manitoba)





Dig It



Gently obtain roots

Checking Roots

Look for small white lemon-shaped cysts



http://www.nwroc.umn.edu/Cropping_Issues/2010/July_20/SoybeanCystNematodeScouting/index.htm



@soilecologyUMan

THANK YOU

- Nazanin Ghavami
- MB Agriculture, WGRF, MPST, AAFC
- Dennis Lange
- Les Mitchell, Anastasia Kubinec
- Dr. Mehrdad Madani, Terri Fairman
- Albert Tenuta, Tom Welacky



Soybean Cyst Nematode



Warning signs:

- **Areas of stunted plants, and poor canopy**
- **Areas of chlorotic growth**
- **Areas where weed control is sub optimum**
- **White females (i.e. cysts) on roots**

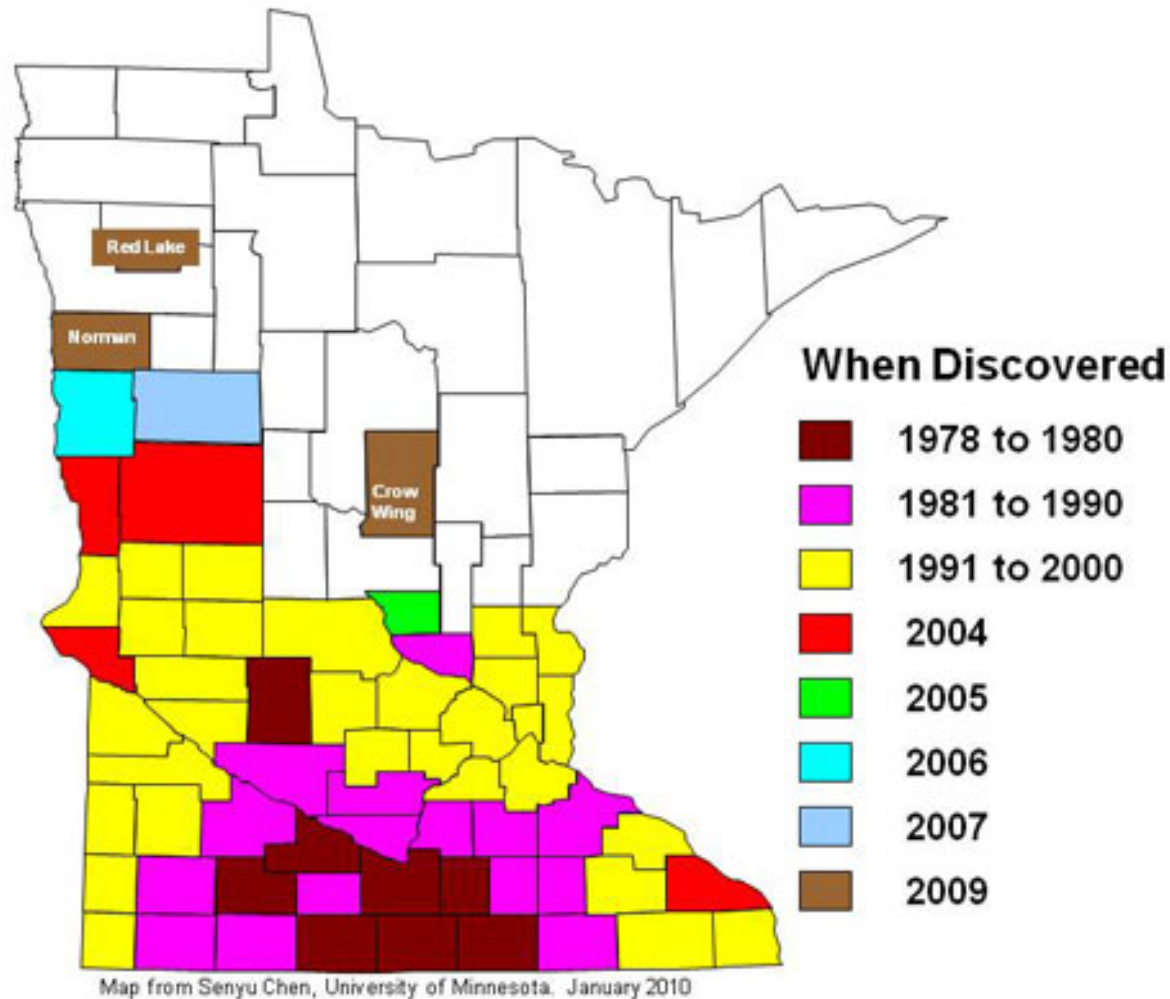
Soil Sampling for SCN

- Every third soybean crop year
- Sampling in fall following crop harvest and before soil freezes
- Following soybean harvest, sample directly within harvested rows before tillage
- Following other crops, sample after fall tillage, if you till
- Sample top eight inches
- Use a soil push probe or small diameter soil auger
- Take 15 cores for a sample from every 20 acres
- Sample specifically for trouble soybean area

More on Soil Sampling

- Put cores into a bucket
- Mix the cores and place into a ziplock freezer bag
- Label both sides of bag with marker for name, legal, date, field sample number
- Keep bag out of sun
- Place in refrigerator
- Drop off samples to Agvise as you would do for soil fertility testing
- SCN is not a regulated pest, so call Mario if samples come back positive

SCN in Minnesota (2009)

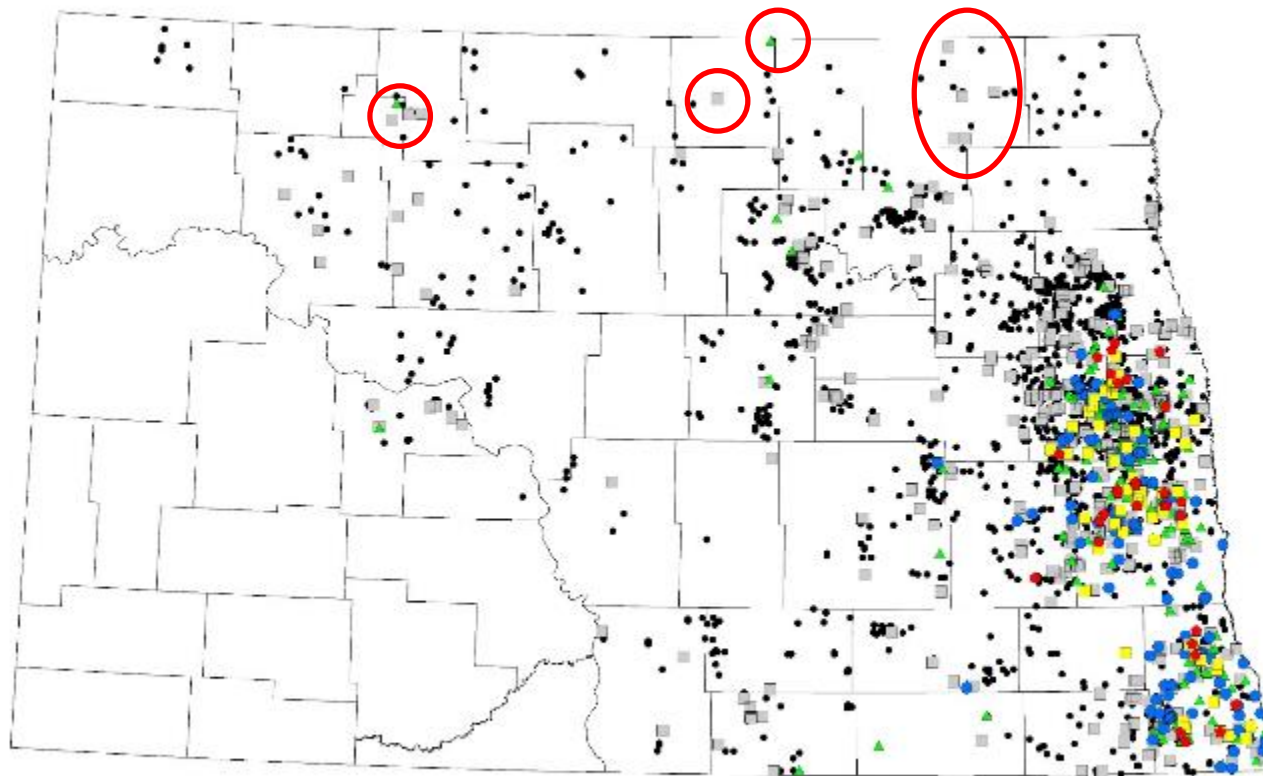


Minnesota counties infested with soybean cyst nematode

SCN Survey in North Dakota



SCN Survey 2013 - 2017



Eggs/100cc

0 12.5 25 50 Miles

• 0 ■ 50 - 200 ▲ 201 - 2000 ● 2001 - 10000 ■ 10001 - 20000 ● 20000 +

SCN and Manitoba

- Cysts with quality for morphological and molecular analysis belonged to genera *Punctodera* and *Cactodera*
- Likely not of economic concern on weeds
- But!!! Most of Manitoba's +1,000,000 acres of soybean production, thus over next 5-10 years likely establishment of SCN in Manitoba

Survey and Development of Molecular Soil Diagnostics for Soybean Cyst Nematode in Manitoba
 Mehrooz Haddad¹, Nazam Ghazemi², Mario Tenuta¹, Albert Tenuta¹, and Tom Welachy³
¹Department of Soil Science, University of Manitoba, Winnipeg, MB, R5T 3J4 Canada
²Agriculture and Ag-Food Canada, Harrow, ON, N0R 1G0, Canada
³Ontario Ministry of Agriculture, Food, and Rural Affairs, Ridgetown, ON, N0P 2C0, Canada

SUMMARY
 The soybean cyst nematode (SCN; Fig. 1 and 2), *Heterodera glycines* Ichinohe, 1952, is the major disease agent of soybean in Canada and worldwide. Early detection of SCN infestations in Manitoba will be critical to limit yield losses. With the survey conducted by the Soil Ecology Laboratory, two published species specific PCR primer sets and three new sets based on mitochondrial COII gene were evaluated for ability to identify SCNs from 22 provinces in Canada and one population from the U.S. The published SCNAI and newly developed Cox II primer sets were able to identify SCNs from Ontario and U.S. Thus, a total of 76 fields with history of having grown three or more soybean crops were sampled over 2013, 2014, and 2015 in Manitoba. One to four cysts were recovered from about 17 of samples. Most of the cysts were round, damaged and empty, but 4 were suitable for microscopic observation and one isolated DNA available for PCR analysis. Based on molecular analyses these cysts were negative for SCNs and they belonged to the genus *Cactodera*, and possibly *Punctodera*. A new survey to determine if nematode 2017 for the presence of SCNs in soybean fields in Manitoba. Further, we continue to develop the PCR assay into a real time method for quantification of SCNs with calibration against traditional egg counts from soil.

RESULTS AND DISCUSSION
PCR Primer Screening
 • Our laboratory investigated the MtCOII gene from 11 glycosylase, CoxII, CoxIII, and SCNAI as well as previously developed the 17S and SCNAI based primer sets for their ability to identify SCNs populations from Ontario (Table 1).
 • The published SCNAI and newly developed Cox II primer sets were able to identify SCNs from Ontario and U.S. without cross-reactivity for other cyst nematode species. The CoxII primer could identify SCNs but provided false positives (some reactivity) to *CC* species.
SCN Survey in Manitoba
 • The samples collected were a few cysts each, with the majority being empty and damaged.
 • Further, most cysts were round and not broken, but the false positive indicator of SCNs.
 • Further, most cysts were round and not broken, but the false positive indicator of SCNs.
 • Just 14 were suitable for microscopic observation and six isolated DNA available for PCR analysis and these were all negative for SCNs by species specific conventional PCR analysis.
 • They belonged to the genus *Cactodera*, and possibly *Punctodera* (Table 2). These are cyst nematodes but not a pest of soybean or important pests of other crop plants in Manitoba.
 • With the survey conducted by the Soil Ecology Laboratory a total of 76 commercial soybean fields in Manitoba have been sampled and are negative for the presence of SCNs.

CONCLUSION
 • Analysis of cyst using developed protocols of SCN identification with species specific primers showed no sensitivity and efficiency. Therefore, these are currently not a survey for detection of SCNs in fields for soybean cultivation in Canada.
 • More fields in Manitoba have a history of three or four crops of soybean. It may still be a few more years until SCNs populations are detected. Further, because SCNs in most the South Dakota and Minnesota border with Manitoba, it is recommended surveys be conducted every two to three years.

Table 1. Survey of soybean cyst nematode (SCN) populations in Manitoba.

Province	Year	Field No.	Sample No.	SCN	Other
Manitoba	2013	1	1	+	-
Manitoba	2013	2	1	+	-
Manitoba	2013	3	1	+	-
Manitoba	2013	4	1	+	-
Manitoba	2013	5	1	+	-
Manitoba	2013	6	1	+	-
Manitoba	2013	7	1	+	-
Manitoba	2013	8	1	+	-
Manitoba	2013	9	1	+	-
Manitoba	2013	10	1	+	-
Manitoba	2013	11	1	+	-
Manitoba	2013	12	1	+	-
Manitoba	2013	13	1	+	-
Manitoba	2013	14	1	+	-
Manitoba	2013	15	1	+	-
Manitoba	2013	16	1	+	-
Manitoba	2013	17	1	+	-
Manitoba	2013	18	1	+	-
Manitoba	2013	19	1	+	-
Manitoba	2013	20	1	+	-
Manitoba	2013	21	1	+	-
Manitoba	2013	22	1	+	-
Manitoba	2013	23	1	+	-
Manitoba	2013	24	1	+	-
Manitoba	2013	25	1	+	-
Manitoba	2013	26	1	+	-
Manitoba	2013	27	1	+	-
Manitoba	2013	28	1	+	-
Manitoba	2013	29	1	+	-
Manitoba	2013	30	1	+	-
Manitoba	2013	31	1	+	-
Manitoba	2013	32	1	+	-
Manitoba	2013	33	1	+	-
Manitoba	2013	34	1	+	-
Manitoba	2013	35	1	+	-
Manitoba	2013	36	1	+	-
Manitoba	2013	37	1	+	-
Manitoba	2013	38	1	+	-
Manitoba	2013	39	1	+	-
Manitoba	2013	40	1	+	-
Manitoba	2013	41	1	+	-
Manitoba	2013	42	1	+	-
Manitoba	2013	43	1	+	-
Manitoba	2013	44	1	+	-
Manitoba	2013	45	1	+	-
Manitoba	2013	46	1	+	-
Manitoba	2013	47	1	+	-
Manitoba	2013	48	1	+	-
Manitoba	2013	49	1	+	-
Manitoba	2013	50	1	+	-
Manitoba	2013	51	1	+	-
Manitoba	2013	52	1	+	-
Manitoba	2013	53	1	+	-
Manitoba	2013	54	1	+	-
Manitoba	2013	55	1	+	-
Manitoba	2013	56	1	+	-
Manitoba	2013	57	1	+	-
Manitoba	2013	58	1	+	-
Manitoba	2013	59	1	+	-
Manitoba	2013	60	1	+	-
Manitoba	2013	61	1	+	-
Manitoba	2013	62	1	+	-
Manitoba	2013	63	1	+	-
Manitoba	2013	64	1	+	-
Manitoba	2013	65	1	+	-
Manitoba	2013	66	1	+	-
Manitoba	2013	67	1	+	-
Manitoba	2013	68	1	+	-
Manitoba	2013	69	1	+	-
Manitoba	2013	70	1	+	-
Manitoba	2013	71	1	+	-
Manitoba	2013	72	1	+	-
Manitoba	2013	73	1	+	-
Manitoba	2013	74	1	+	-
Manitoba	2013	75	1	+	-
Manitoba	2013	76	1	+	-

Table 2. Survey of soybean cyst nematode (SCN) populations in Manitoba.

Province	Year	Field No.	Sample No.	SCN	Other
Manitoba	2013	1	1	+	-
Manitoba	2013	2	1	+	-
Manitoba	2013	3	1	+	-
Manitoba	2013	4	1	+	-
Manitoba	2013	5	1	+	-
Manitoba	2013	6	1	+	-
Manitoba	2013	7	1	+	-
Manitoba	2013	8	1	+	-
Manitoba	2013	9	1	+	-
Manitoba	2013	10	1	+	-
Manitoba	2013	11	1	+	-
Manitoba	2013	12	1	+	-
Manitoba	2013	13	1	+	-
Manitoba	2013	14	1	+	-
Manitoba	2013	15	1	+	-
Manitoba	2013	16	1	+	-
Manitoba	2013	17	1	+	-
Manitoba	2013	18	1	+	-
Manitoba	2013	19	1	+	-
Manitoba	2013	20	1	+	-
Manitoba	2013	21	1	+	-
Manitoba	2013	22	1	+	-
Manitoba	2013	23	1	+	-
Manitoba	2013	24	1	+	-
Manitoba	2013	25	1	+	-
Manitoba	2013	26	1	+	-
Manitoba	2013	27	1	+	-
Manitoba	2013	28	1	+	-
Manitoba	2013	29	1	+	-
Manitoba	2013	30	1	+	-
Manitoba	2013	31	1	+	-
Manitoba	2013	32	1	+	-
Manitoba	2013	33	1	+	-
Manitoba	2013	34	1	+	-
Manitoba	2013	35	1	+	-
Manitoba	2013	36	1	+	-
Manitoba	2013	37	1	+	-
Manitoba	2013	38	1	+	-
Manitoba	2013	39	1	+	-
Manitoba	2013	40	1	+	-
Manitoba	2013	41	1	+	-
Manitoba	2013	42	1	+	-
Manitoba	2013	43	1	+	-
Manitoba	2013	44	1	+	-
Manitoba	2013	45	1	+	-
Manitoba	2013	46	1	+	-
Manitoba	2013	47	1	+	-
Manitoba	2013	48	1	+	-
Manitoba	2013	49	1	+	-
Manitoba	2013	50	1	+	-
Manitoba	2013	51	1	+	-
Manitoba	2013	52	1	+	-
Manitoba	2013	53	1	+	-
Manitoba	2013	54	1	+	-
Manitoba	2013	55	1	+	-
Manitoba	2013	56	1	+	-
Manitoba	2013	57	1	+	-
Manitoba	2013	58	1	+	-
Manitoba	2013	59	1	+	-
Manitoba	2013	60	1	+	-
Manitoba	2013	61	1	+	-
Manitoba	2013	62	1	+	-
Manitoba	2013	63	1	+	-
Manitoba	2013	64	1	+	-
Manitoba	2013	65	1	+	-
Manitoba	2013	66	1	+	-
Manitoba	2013	67	1	+	-
Manitoba	2013	68	1	+	-
Manitoba	2013	69	1	+	-
Manitoba	2013	70	1	+	-
Manitoba	2013	71	1	+	-
Manitoba	2013	72	1	+	-
Manitoba	2013	73	1	+	-
Manitoba	2013	74	1	+	-
Manitoba	2013	75	1	+	-
Manitoba	2013	76	1	+	-